

CLAIMS

10/594606

1. (Amended) An article with a silica-based film, the article comprising a substrate and a silica-based film that is formed on a surface of the substrate by a sol-gel process and substantially free from an organic substance,
5 wherein the thickness of the silica-based film is more than 300 nm, and
the silica-based film does not separate from the substrate after the Taber abrasion test prescribed in Japanese Industrial Standards R 3212
10 that is carried out with respect to a surface of the silica-based film.
2. The article according to claim 1, wherein the thickness of the silica-based film is not less than 350 nm and less than 1 μ m.
- 15 3. The article according to claim 2, wherein the thickness of the silica-based film is not less than 400 nm and less than 1 μ m.
4. The article according to claim 1, wherein the substrate is a glass plate or a resin plate.
- 20 5. The article according to claim 1, wherein the substrate is a glass plate containing an alkali component and the silica-based film is substantially free from an alkali component.
- 25 6. (Amended) A process for producing an article with a silica-based film by a sol-gel process, the article including a substrate and a silica-based film that is formed on a surface of the substrate and substantially free from an organic substance,
the process comprising:
30 applying a film-forming solution for forming the silica-based film to the surface of the substrate, and
heating the substrate to which the film-forming solution has been applied,
wherein the film-forming solution contains silicon alkoxide, strong
35 acid, water, and alcohol;

the silicon alkoxide has a concentration of more than 3 mass% and less than 9 mass% in terms of a SiO₂ concentration when silicon atoms contained in the silicon alkoxide are expressed as SiO₂;

5 the number of moles of the water is at least four times and at most ten times the total number of moles of the silicon atoms contained in the silicon alkoxide;

10 the strong acid has a concentration in the range of 0.001 to 0.2 mol/kg in terms of the molality of protons that is obtained assuming that the protons have dissociated completely from the strong acid; and

15 the substrate is heated at a temperature above 100°C.

7. The process for producing an article according to claim 6, wherein the film-forming solution is applied so that the thickness of the silica-based film exceeds more than 300 nm.

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8. The process for producing an article according to claim 7, wherein the film-forming solution is applied so that the thickness of the silica-based film is not less than 350 nm and less than 1 μm.

20 9. The process for producing an article according to claim 6, wherein the substrate is heated at a temperature above 150°C.

10. The process for producing an article according to claim 9, wherein the substrate is heated at a temperature above 150°C and not more than 25 400°C.

11. The process for producing an article according to claim 6, wherein the silicon alkoxide contains at least one selected from tetraalkoxysilane and a material made by polymerization of tetraalkoxysilane.

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12. The process for producing an article according to claim 6, wherein the substrate is a glass plate or a resin plate.

35 13. (added) The article according to claim 1, which is free from cracks in the silica-based film.

14. (added) The article according to claim 1, wherein the silica-based film is free from a hydrophilic organic polymer.

15. (added) The process for producing an article according to claim 6,
5 wherein the silicon alkoxide has a concentration of more than 3 mass% and not more than 5 mass % in terms of the SiO₂ concentration;
the number of moles of the water is at least four times and at most eight times the total number of moles of the silicon atoms; and
the strong acid has a concentration in the range of 0.001 to 0.05 mol/kg in
10 terms of the molality of protons.